NASA Activities

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THIS ISSUE

"...One giant leap for mankind..." The words still echo from that time 20 years ago when a human being first placed his foot on the surface of the moon. The thoughts of the Apollo 11 crew two decades after that momentous event are recorded in an interview presented in this issue of ***NASA Activities.***

The drama of the Apollo 11 journey to the surface of the Moon and back to a safe splashdown in the Pacific is recorded in the highlights from the log of the Eagle and Colombia in this issue. Photographs from the mission capture the stark boldness of man's first tentative steps into the solar system.

One of America's best-known space artists, **Robert McCall, is featured with his "Apollo Story Lithographs"** detailing major moments of the Apollo flight. His "salute to Apollo", from the NASA Art program is found on the "NASA Visions" page.

The shape of things to come is provided by students of Virginia Polytechnic Institute as they model the X-30 National Aero-Space Plane. **The story is told in "Agency Highlights", as is the technological human touch of the U.S./Soviet Spacebridge to aid Armenian earthquake and Ufa train disaster victims.**

The story of a new solid rocket program and its first test come to us from Marshall, **while self diagnostic and self repairing aircraft emerge from fiction to reality** at Ames-Dryden.

Next Month:

Pegasus: New Wings to Space.

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About the Cover

Alan B. Chinchar's acrylic, entitled "One Small Step for a Man" commemorates the 20th Anniversary of man's first lunar landing from NASA Space Art Collection. Apollo 11 Astronaut Edwin E. "Buzz" Aldrin is depicted in the painting with the image of the Earth reflected in his visor.

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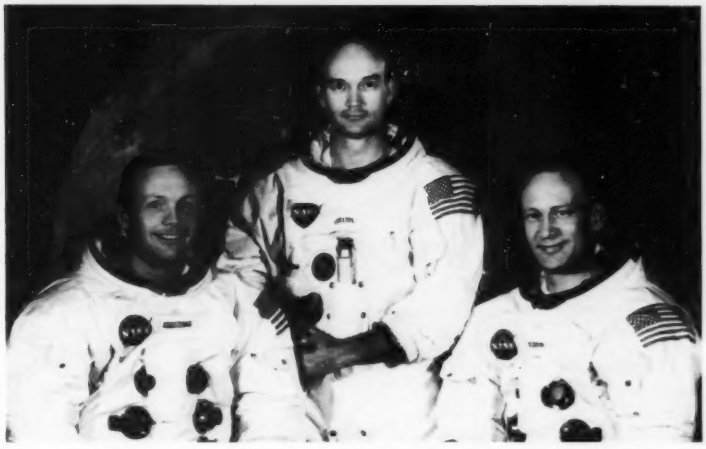
"...One Giant Leap for Mankind..."

Reminiscences and Responses of the Crew on the Singular Event of Our Time: The Landing of Apollo 11 on the Moon, July 20, 1969

(The following are excerpts from an interview conducted by NASA Public Affairs Broadcast and Audiovisual Branch at the National Air and Space Museum, May 26, 1989. Participating were Apollo 11 crewmembers, Neil A. Armstrong, Edwin E. Aldrin and Michael Collins.)



The Apollo 11 crew (from l to r) Neil A. Armstrong, commander; Michael Collins, command module pilot; and Edwin E. Aldrin, Jr., lunar module pilot.

NASA Activities: **What is your most vivid memory and most personally rewarding part of the mission?**

Armstrong: Apollo 11 is filled with vivid experiences. One that comes to mind in my case, is the flying through the moon shadow and seeing the sun eclipsed by the moon as we approached it. That was a very spectacular sight. I think perhaps the final decent to the lunar surface was for me the highlight of the flight. It was very challenging with a lot of unknowns and it was, for a pilot, it was a wonderful experience.

Collins: Well, I think the thing I remember most visually is the ascent stage of the lunar module, the ascent stage of Eagle, in front of my window and then in the background, seeing the lunar horizon and seeing the earth pop up above it, so that you had the horizon, the lunar model and the earth all in a row. I thought that was something that would rarely be seen again and I remember that most vividly.

There's so many things that can go wrong on a trip to the moon and back. It's sort of a long and fragile daisy chain of events. None of those little links broke and to me, that was the amazing part, that everything worked in sum as well as it did.

Aldrin: I think for me, that most memorable time may not have been at the happening I was most aware of, but I've had occasion to challenge my memory and think back of those first few seconds when Neil and I touched down and there were numerous things that we needed to do, but we also needed to announce to the world that we were there and then pause for a moment and things were quiet and we gazed out the window and it was just a magnificent view. And that's the most impressive memory that I carry now because I refer back to it so many times.

I think the most rewarding part of the Apollo 11 was having it to be the major event in my life, which changed my life entirely and gave me an opportunity to reorder priorities and try to course off for the future.

NASA Activities: **Neil, please tell us about your famous statement when you first stepped on the moon.**

Armstrong: Well, actually I didn't worry about it until after landing because I guess in my own view, we didn't have that good a chance of completing a successful landing. But I did think about it between the time of landing and the time when we actually exited the spacecraft, Buzz and I did that.

NASA Activities: **Neil and Buzz, what were your immediate impressions of the lunar surface when you first walked on it and touched it?**

continued on next page

Armstrong: Well, I think the impressions of the moon started much earlier, on our approach thousands of miles. As we got closer and closer, we could see more and more. As we got down into the low orbit about the moon, we could see additionally more. We kept getting impressions... and after landing, of course, then we were very close. We had hours to stand there, a mere 15 feet, say, above the surface.... We had a sense of the gravity, the character of the environment there, so long before we actually got out on the surface, we already had a pretty good appreciation for what the moon was like.

Aldrin: I agree with Neil. There are many different moons to remember, the one that we see from the earth, the one that's in route as we're sort of alone between the sun and the earth and the moon. Then as we approach the moon, it's a different one. When you're in orbit, you look down on it and it's a rather rough lonesome, forboding location... I think I was relieved by the ease that we had in being able to maneuver around. Perhaps impressed by the talcum powder nature of the fine surface itself; as you'd look at a boot print, it just was so smooth, just like you'd put your foot in talcum powder.

It was a stranger to me before the mission, but I know look back at it as somewhat of a friend, a place that I've visited.

Neil A. Armstrong

NASA Activities: **Mike, how did you feel orbiting the moon alone?**

Collins: Well, I enjoyed being in the command module by myself. It was a happy little home. All the machinery was working properly and my concerns were not within the command module, but simply that something might go wrong with the landing, with the lunar module, and these two guys might get stuck on the surface of the moon. That was my main concern.

NASA Activities: **What goes through your mind When you think back to viewing Earth as a whole from so far out in space?**

Michael Collins

Collins: Well, the Earth as it appears from the moon is a very small and fragile object and when you think about it, that's not an inaccurate description. Certainly, a lot of the things that we down here can affect the balance in a very fragile way.

The greenhouse effect we're noticing today, for example, the changes between a healthy atmosphere and an unhealthy atmosphere are very subtle, very fragile and you sort of get that feeling when you look at the earth from a great distance.

Edwin E. Aldrin

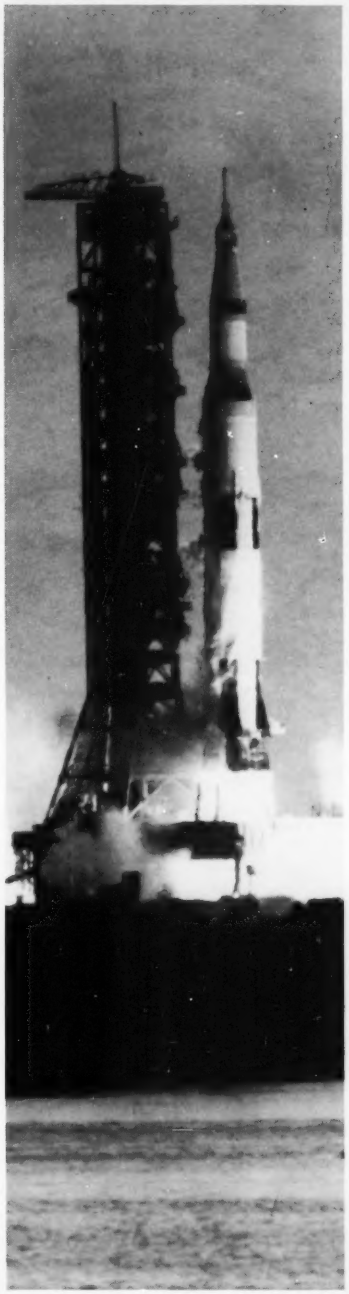
NASA Activities: **One final question. What advice do you have for young people who might be interested in a space career?**

Armstrong: Well...I'd advise them not to listen to my advice.

Collins: I'm very reluctant to advise young people as to what to study. The requirements for space travel keep changing...I think what is important is that children do well in whatever field thy choose. I think excellence is the key to it and excellence is a lot more important than excellence in a particular field. ■

Apollo 11: Log of the Eagle and Columbia

Highlights of Mankind's Most Remarkable Voyage in Space



The flight of Apollo 11 attained the national goal set by President John F. Kennedy in 1961, of landing men on the Moon and returning them safely to Earth within the decade of the 1960's.

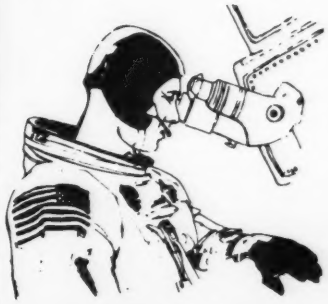
Launched July 16, 1969 at 9:32 a.m. eastern time, the activities of the Apollo 11 crew were viewed live around the world by the largest television audience in history.

The return of Apollo 11 to Earth resulted in a splash down of the craft's command module in the Pacific Ocean southwest of Hawai' at 12:51 p.m. EDT, July 24 after an 8 day, 3 hour and 19 minute flight. Major points of that spectacular mission follow:

July 16, 1969, 9:32 a.m. (all times EDT)

Apollo 11 blasts off from Launch Pad 39A, Kennedy Space Center, Florida.

Strapped to their couches in the command module atop the 363-foot, 7.6 million pound thrust launch vehicle are three astronauts, Commander **Neil A. Armstrong**, civilian and ex-test pilot; Command Pilot **Michael Collins** and Lunar Module Pilot **Edwin E. (Buzz) Aldrin, Jr.**, both U.S. Air Force officers.



From Launch Control the last words were: "Good Luck and Godspeed."

...9:44 a.m. — Apollo 11 enters a 118 mile-high Earth orbit.

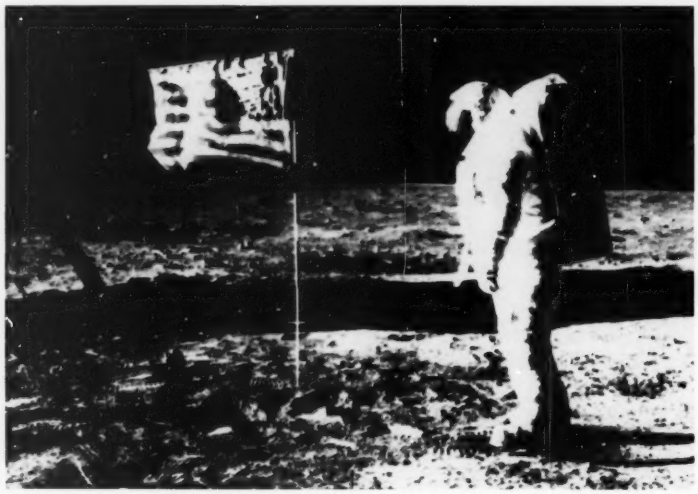
...12:22 p.m. — Another firing boosts Apollo 11 out of orbit midway in its second trip around the Earth and onto its lunar trajectory at an initial speed of 24,200 miles per hour.

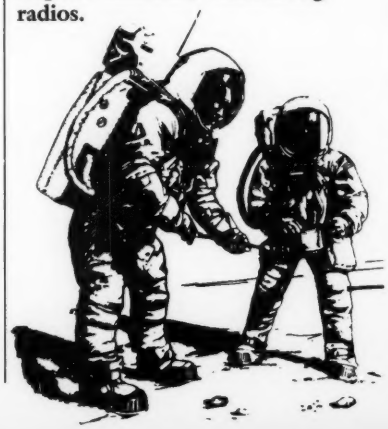
...12:49 p.m. —Columbia then separates from the adapter and returns to dock head-to-head with it. Docking complete, **the lunar module and the mated command/service and lunar modules separate from the Saturn V and continue alone toward the**

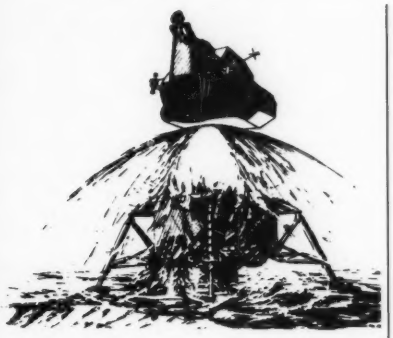
continued on next page

Moon.
July 17, 12:17 p.m. — A three second mid-course correction burn sharpens the course of the spacecraft and tests the engine that must get them in and out of lunar orbit.
...July 18, 11:12 p.m. — Just before entering the Moon's sphere of influence at a point nearly 38,900 miles from the Moon, the spacecraft has slowed to under 2,040 miles per hour.
...July 19, 10:42 a.m. — Armstrong announces: **"The view of the Moon that we've been having recently is really spectacular...** It's a view worth the price of the trip."
...12:58 p.m. — Mission Control informs crew: "We're 23 minutes away from the LOI (Lunar Orbit Insertion) burn. Seconds later: **"You are go for LOI." Aldrin replies: "Roger, go for LOI."**
...1:13 p.m. — Spacecraft passes completely behind the Moon and out of radio contact with Earth for the first time.
...1:28 p.m. — The spacecraft's main rocket is fired to slow the vehicle so that it can be captured by lunar gravity. It is still behind the Moon.
...1:55 p.m. — Armstrong tells Mission Control: "We're getting this first view of the landing approach.
July 20,1:46 p.m. — The lunar module is separated from the command module in which Collins continues to orbit the Moon.
...3:08 p.m. — Armstrong and Aldrin, flying feet first and face down, fire the landing craft's descent engine for the first time.
...3:47 p.m. — Collins, flying the command ship from behind the Moon, reports to Earth that the landing craft is on its way down to the lunar surface.
...4:05 p.m. — Armstrong throttles up the engine to slow the LM before dropping down on the lunar surface. The landing is not easy. Seeing that they are approaching a crater about the size of a football field and covered with large rocks, **Armstrong takes over manual control and steers the craft to avoid a large crater.** His heartbeat has risen from a normal 77 to 156.
...4:18 p.m. — With 30 seconds of fuel left, the craft settles down with a jolt. Armstrong immediately radios Mission Control: **"Houston, Tranquility Base, the Eagle has landed."**
...10:39 p.m. —
Five hours ahead of the original schedule, Armstrong opens the hatch and squeezes through.

Armstrong moves slowly down the 10-foot ladder and halts on the last step. **"I'm at the foot of the ladder'" he reports. "The LM footpads are only depressed in the surface about one or two inches...the surface appears to be very, very finegrained as you get close to it, it's almost like a powder."**
...10:56 p.m. — Armstrong puts his left foot on the Moon. It is the first time in history that man has ever stepped on anything that has not existed on or originated from the Earth. **"That's one small step for a man, one giant leap for mankind," Armstrong radios.**



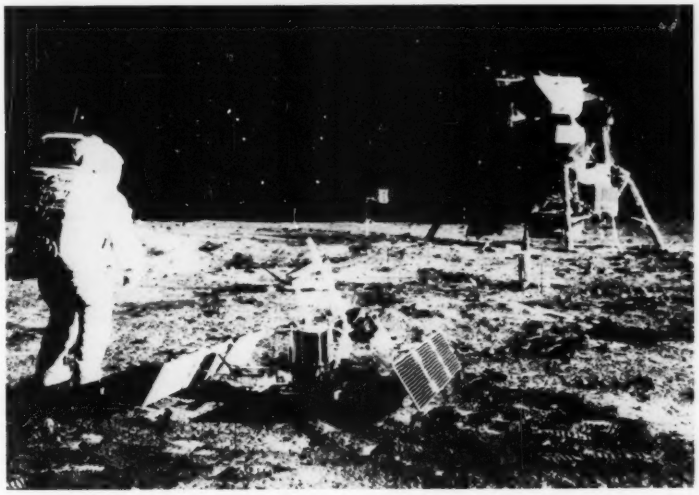




"The surface is fine and powdery," he says. "I can pick it up loosely with my toe...I only go in a small fraction of an inch...

"There seems to be no difficulty in moving around as we suspected. It's even perhaps easier than the simulations...."

Armstrong begins making a preliminary collection of soil samples. Aldrin emerges from the landing craft while his companion photographs him.



Armstrong trains a TV camera on a small, stainless steel plaque on one of the legs of the landing craft. He reads: "Here men from the planet Earth first set foot on the Moon. July 1969 A.D. We came in peace for all mankind."

The astronauts set up the first of three experiments, a "solar wind" particle collector.

...11:41 p.m. — From a leg of the spacecraft, the astronauts take a three-by-five-foot, nylon U.S. flag, its top edge braced by a spring wire to keep it extended on the windless Moon and erect it on a staff pressed into the lunar surface.

...11:48 p.m. — During a phone call from the White House, President Richard M. Nixon remarks, **"For one priceless moment, in the whole history of man, all the people on this Earth are truly one."**

While Armstrong collects and packs rock and soil specimens, Aldrin sets up two other experiment packages: a seismic detector and a laser-reflector.

...July 21, 1:09 a.m. — Armstrong and Aldrin return to the lander for housekeeping and sleep.

...1:54 p.m. — The ascent engine is started and Eagle, using the descent stage as a launch pad, begins rising to orbit.

...5:35 p.m. — Eagle redocks with Columbia while circling on the back side of the Moon.

...7:42 p.m. — Eagle is jettisoned.

...July 22, 12:56 a.m. — While on the back side of the Moon, with Eagle 20 miles behind, the transearth injection burn of Apollo11 is begun.

...1:39 p.m. — Columbia passes a point in space, nearly 39,000 miles from the Moon and over 200,000 miles from Earth, where Earth's gravity begins drawing the astronauts homeward.

...July 23, 3:56 p.m. — Spacecraft passes midway point of journey homeward, over 116,000 miles from splashdown.

...July 24, 12:21 p.m. — Command and service modules of Columbia are separated.

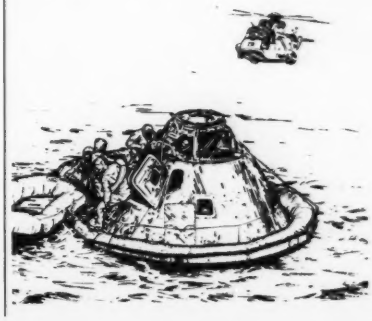
...12:35 p.m. — Command module reenters the Earth's atmosphere.

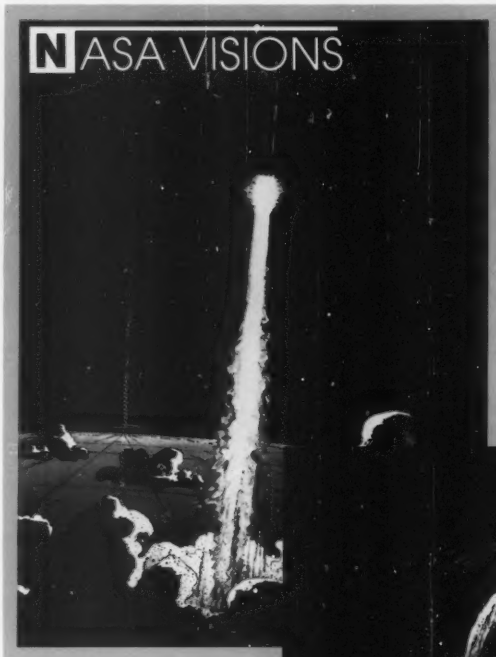
...12:51 p.m. — Spacecraft splashes down 950 miles southwest of Honolulu and about 15 miles from the recovery ship, U.S.S. Hornet.

...1:57 p.m. — Astronauts arrive on flight deck of the Hornet via helicopter. President Nixon welcomes the astronauts through a window in a quarantine trailer.

3:55 p.m. — Command module arrives on board the Hornet after traveling 1,095,605 miles.

So ends man's first mission to the Moon. ■

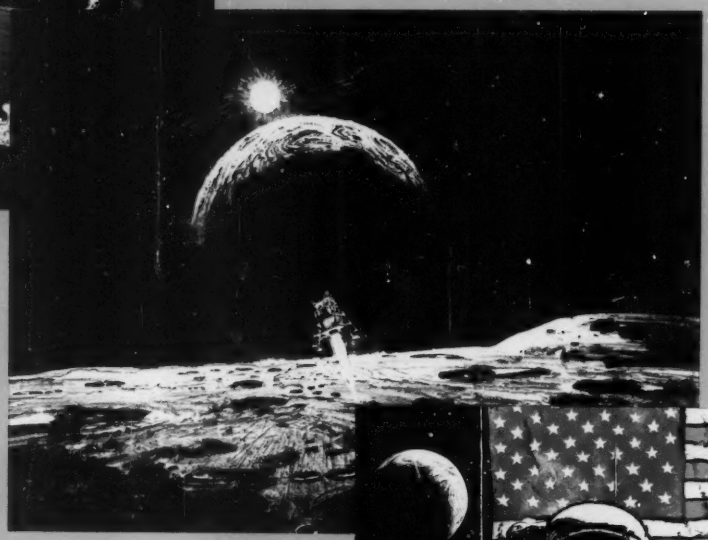


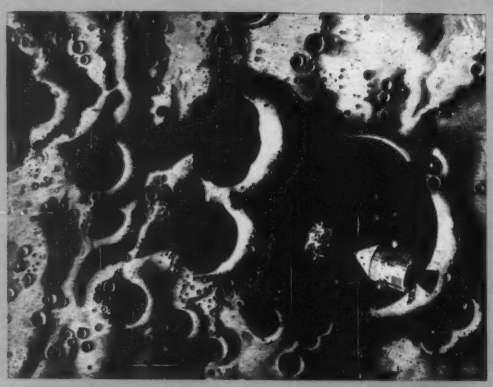


A Salute to Apollo 11

From the NASA Space Art Collection

One of America's best-known space artists, Robert McCall, has provided a number of paintings for "Apollo Story Lithographs" saluting the Apollo program. The paintings are a part of the NASA Art Program. McCall's coverage of the space program dates from the 1950's. The selections for "NASA Visions" include "Launch", "Lunar Landing", "First on the Moon" and "Rendezvous" and depict the Apollo 11 lunar landing mission. ■





VPI Built X-30 Mockup Debuts

A mockup of the National Aero-Space Plane (NASP), built at Virginia Polytechnic Institute and State University (Virginia Tech), Blacksburg, Va., is being readied for display in the mid-west after its debut at the Paris Air Show.

A group of engineering students at Virginia Tech has spent five months designing and building the mockup for the jointly funded NASA/Department of Defense NASP program. The mockup was displayed at the U.S. pavilion at the Paris Air Show in June and is slated for exhibition at the Dayton Air and Trade Show later this summer.

Working under an existing NASA grant with funds provided by the NASP Joint Program Office, the mechanical and aerospace engineering students have designed and built the 80-foot-long mockup based on a generic government concept for the vehicle. The mockup had a $73,000 budget.

The mockup was turned over to the Joint Program Office at a special rollout ceremony at Virginia Tech on May 5.

Virginia Tech was selected for the project because a number of engineering faculty members already were involved with design aspects of NASP and the students were able to work under an existing grant. The students have worked under the guidance of Mechanical Engineering Professor Walter O'Brien and Associate Dean of Engineering Jim Marchman. The project was coordinated for the NASP Joint Program Office by Dick Culpepper, director of technology transfer.

The students began the project in December 1988. An ambitious undertaking for the 5 months allocated to the project, the students worked in teams, devoting many evening and weekend hours to assure completion. The students used computer- aided design facilities at Virginia Tech to assist with the mockup's design. A structures team took the project from design to frame by cutting and hand-fitting pieces of aluminum. The frame then was fitted with expanded polystyrene foam. The final weatherproof finish was done in red, white and blue.

The NASP program is currently in the technology development phase. The program's goal is an X-30 research aircraft that would demonstrate the technologies needed to take off and land on conventional runways, reach hypersonic speeds up to Mach 25 through the atmosphere and achieve Earth orbit, using a liquid hydrogen-fueled air-breathing engine. ■

Finalists Named for Quality and Productivity

Eight finalists have been selected for the NASA Excellence Award for Quality and Productivity for 1988/89. They include:

- Barrios Technology, Houston
- Bendix Field Engineering Corp. Columbia, Md.
- Boeing Computer Support Service (Computational Mission Services) Huntsville, Ala.
- Computer Sciences Corp. Houston
- EG&G Florida, Inc. Kennedy Space Center, Fla.
- Grumman Technical Services Division, Titusville, Fla.
- Lockheed Engineering & Sciences Co., Houston
- Rockwell International Corp. Space Transportation Systems Division Downey, Calif.

NASA Associate Administrator for Safety, Reliability, Maintainability and Quality Assurance George A. Rodney announced the finalists after a 6-month selection process.

The award is administered for NASA by the American Society for Quality Control, Milwaukee, Wisc. The award recognizes NASA prime contractors, subcontractors and suppliers for outstanding achievement in quality and productivity improvement. Award recipients will be announced October 31, 1989. ■

U.S./Soviet Spacebridge Extended To Train Victims

The Spacebridge project with Armenia, USSR, was extended to Moscow and Ufa to assist the victims of a recent accident involving two trains destroyed by a gas explosion outside the Soviet city of Ufa in the Ural Mountains.

Spacebridge linked medical facilities and doctors in Yerevan, Armenia, with U.S. doctors in Bethesda and Baltimore, Md., Houston, and Salt Lake City, Utah.

Dozens of physicians met from 9 a.m. to 1 p.m. EDT (6 p.m. to 10 p.m. Armenian time), Monday through Friday, to discuss difficult medical cases resulting from the Armenian earthquake disaster. Each case presented was representative of many people suffering the same medical problems. Some cases involved people who lost limbs in the disaster and needed prostheses, reconstructive surgery or rehabilitation. The daily Spacebridge sessions continued through June 29.

Linked by satellite, the doctors had access to audio, visual and facsimile communications capability at NASA Headquarters in Washington, D.C., the Republic Diagnostic Center, Yerevan, Armenia, outside the disaster zone, the Uniformed Services University of the Health Sciences in Bethesda, the University of Maryland Institute of Emergency Medical Services System in Baltimore, the University of Texas Health Science Center in Houston, the University of Utah and LDS Hospital in Salt Lake City.

The new link with Moscow and Ufa extended the U.S. medical expertise used particularly in the area of burn treatment. The Soviet Ministry of Telecommunications provided the technical communications link between Moscow, Ufa and Yerevan.

The procedures were similar to those used to consult on the Armenian earthquake victims. Each day, Armenian doctors prepared their cases according to an agenda that set the subject for each day's consultation, faxing data on the cases to U.S. participants before each session began.

During the consultation, the Armenian doctors presented their cases one by one, sometimes with the patient on hand, displaying x-rays, CT scans and other relevant data. Doctors at the U.S. medical centers then made recommendations for treatment or further study.

Many of the Armenian cases discussed concerned injuries requiring reconstructive or plastic surgery, orthopedics or prosthetics. Post-traumatic stress disorders also accounted for cases requiring psychiatric or psychological treatment. Many of the consultations focused on public health issues such as sanitation problems and epidemiological concerns.

The Spacebridge turned out to be a very successful endeavor according to NASA and other participating American physicians in the four medical centers. Extending the program to assist the train victims further enhanced U.S./USSR relationships. This program also serves future space exploration by providing Spacebridge participants with knowledge of how to conduct a complicated telemedicine consultation as might occur on a space station. ■

Logo for Space Station Freedom Program

NASA's Office of Space Station has issued its official logo for the permanently manned space station, Freedom. The logo was designed by Justin Associates of Washington, D.C.

"With the adoption of the logo, the Freedom program has a symbol that will distinguish it from all others," said Tom Moser, former acting associate administrator for the space station program, in announcing the new logo.

The logo depicts a stylized version of the Freedom program's manned base featuring two of its most dominant features — the pressurized modules where space station crew members will work and live and the large solar panels. The circular shape in the background represents both the Earth and other planets. An important element of the logo is the name, Freedom, which was announced last year by former President Ronald Reagan.

Space Station Freedom will be an international space complex used for fundamental research in the materials and life sciences, and to explore the Earth and outer space. Ultimately, Freedom will be an orbital stepping stone for extending human presence beyond Earth orbit into the solar system. ■

CENTER HIGHLIGHTS

Marshall Fires Solid Rocket In New Program

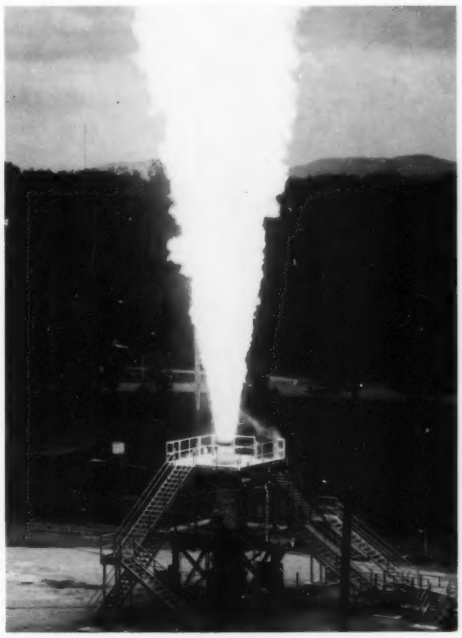
NASA engineers at the Marshall Space Flight Center in Huntsville, Ala, recently fired a 26-foot long, 100,000 pound thrust solid rocket motor for approximately 32 seconds. The test was the first firing of this special motor at the Marshall Center. It is part of NASA's Solid Propulsion Integrity Program to better design, build and verify solid rocket motors.

The purpose of the test was to learn more about solid rocket motor insulation and nozzle materials and to provide young Marshall engineers additional hands-on expertise in solid rocket motor technology. This and subsequent tests are also intended to look at new test motor instrumentation. Among other things, candidate nozzle and insulation materials for NASA's new Space Shuttle Advanced Solid Rocket Motor, which is about to enter development for use in 1994, were tested.

The firing of the motor, named the Modified NASA Motor, was conducted in a newly constructed test stand in the Center's East Test Area. The test motor is 48 inches in diameter and was loaded with two propellant cartridges weighing a total of approximately 12,000 pounds.

The Solid Propulsion Integrity Program originated from joint NASA-Department of Defense-industry studies in 1984 which identified critical shortfalls in the U. S. engineering technology base for solid-fueled rocket motors, said Richard Brown, manager of Marshall's Solid Propulsion Research and Technology Office.

The objective of the program is to provide NASA engineers with the techniques, engineering tools and computer programs to be able to better design, build and verify solid rocket motors. ■



A 26-foot long, 100, 000 pound thrust solid rocket motor test kicks off Solid Propulsion Integrity program.

Ames-Dryden Flies First Aircraft Self-Diagnostics System

In the first flight of a joint NASA/USAF program that promises self-repairing flight controls and lower maintenance costs in future aircraft, computers aboard the NASA Ames-Dryden F-15 Flight Research Aircraft were able to correctly identify and isolate in flight a simulated failure in the flight control system.

Flight control system failures can and do occur during flight. When this happens, costly ground maintenance diagnostic tests are conducted to try to identify the failure so that appropriate corrective actions may be taken. In many cases, the failure cannot be identified during ground tests because the actual flight conditions are not duplicated. With the new expert system technology, failures can be identified and isolated before landing and be fixed immediately.

The first simulated failure was an angle-of-attack sensor.

"This is a real breakthrough in flight control system maintenance diagnosis for future aircraft," says F-15 Flight Research Aircraft Project Manager Dr. James Stewart.

Other technologies, scheduled to begin flight tests this fall, include failure detection, identification and reconfiguration of the flight control system.

An example of the need for reconfiguration is when a tail surface fails in flight. The flight control system will be reconfigured (repair itself) so that other surfaces take over the function of the failed tail surface. Also, a pilot alert system will tell the pilot what the problem is and what the new configuration and flight envelope are after the system has self repaired. ■

The Propfan Test Assessment aircraft flies in a test over White Sands Missile Range, N.M. A microphone instrumented Lear 25 (front) maps propeller noise.

Final Propfan Flight Tests at Lewis

By Linda S. Ellis, LERC

A one-of-a-kind aircraft has been gathering attention in Cleveland skies for the past few months. The airplane is the propfan test assessment (PTA) aircraft, a modified Gulfstream II equipped with an eight-bladed, single-rotation, advanced turboprop (propfan) on its left wing.

Tests show that advanced turboprop propulsion systems can reduce fuel usage by 25 to 30 percent compared to future turbofan engines with equivalent levels of advanced technology. To reap the benefits of this major advance in aero-propulsion technology, the U.S. aviation industry is currently considering the development of several new engines and aircraft that may incorporate advanced turboprop propulsion systems.

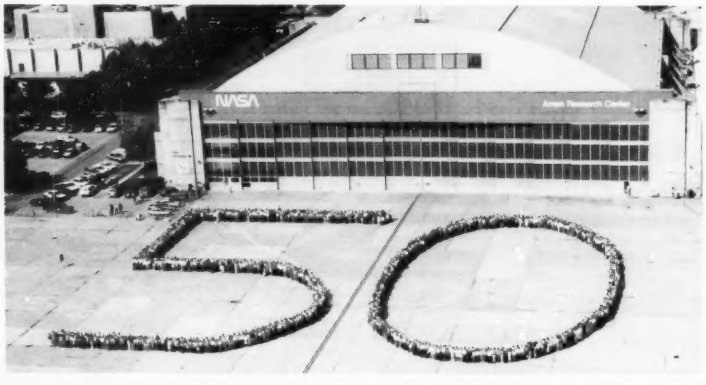
The NASA flight test, consisting of three phases and totaling about 100 hours, began in February to collect data that will help verify predicted loads as well as propfan acoustics.

The first phase of the PTA tests was staged in Cleveland from NASA Lewis Research Center. Researchers flew the PTA aircraft in formation with a microphone-instrumented Lear 25 aircraft to map the propeller source noise in the vicinity of the PTA vehicle. This test phase added to the noise source mapping conducted earlier in the original PTA program. The second phase was conducted in April in conjunction with NASA's Langley Research Center, Hampton, Va., and the Federal Aviation Administration.

The flights were conducted from NASA facilities at El Paso, Texas, and overflew a segment of the White Sands Missile Range in N.M., where ground measurements of propfan enroute noise were made. The PTA aircraft flew at altitudes ranging from about 2,000 feet to 35,000 feet during the 3-week test period.

These flights provided ground-based researchers with their first opportunity to collect PTA enroute noise data generated during low altitude overflights. Previous data collection investigated ground noise generated only by altitude overflights.

The third and final phase of flights will be conducted from Lewis Research Center during May and June. Instantaneous pressure measurements on propfan blade surfaces will be taken at several flight speeds with a range of power settings on the eight-bladed propfan. ■



Approximately 2,500 Ames Research Center employees gathered one fine morning recently to create an acre-sized "50" in honor of Ames' 50th anniversary, which will be celebrated this year. Ames' accomplishments include solution of the problem of atmosphere entry from space; early design of the Space Shuttle; first trips to Jupiter and Saturn; first comprehensive exploration of Venus; and first use of supercomputers for a range of aircraft and spacecraft designs.

Shuttle Landing Gear Tests Scheduled at Ames-Dryden

By Nancy D. Lovato, DFRF

Extensive tests of Space Shuttle orbiter landing gear assemblies, from normal conditions up to and including failure modes, will be conducted by NASA's Ames-Dryden Flight Research Facility, Edwards, Calif., using a CV-990 aircraft. Planning and modifications to the CV-990 begin this year, with flight tests scheduled for 1990.

Data from the tests will give engineers information on what to expect should an orbiter experience a flat tire or other anomalies on landing and will provide data to help in developing crew procedures for various landing conditions and situations.

Says Ames-Dryden Project Manager Robert S. Baron, "by testing on actual landing surfaces, we can provide real-world experience for accurate simulations so that the astronauts will know better what to expect in any situation."

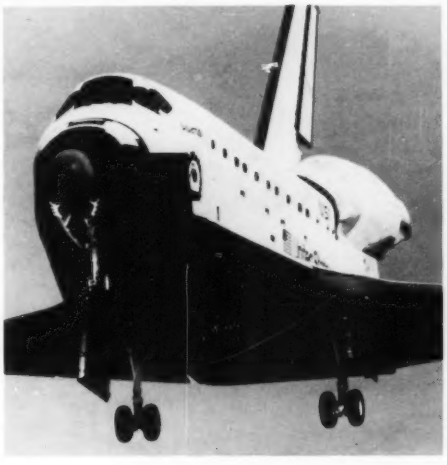
The tests are part of a continuing effort by NASA's Johnson Space Center to upgrade and enhance Space Shuttle landing capabilities.

In addition to assessing and documenting performance of main and nose landing gear assemblies and tire and wheel assemblies, tests will evaluate brake and nose gear steering performance.

During the program, tests will be conducted on lakebed and concrete runways at Edwards, on the concrete Kennedy Space Center runways and on lakebed runways at White Sands Space Harbor.

The CV-990 will retain its normal gear. The orbiter landing gear will be installed so that it can be lowered hydraulically when the aircraft first contacts the landing surface.

The test gear assembly will be mounted on the CV-990's fuselage between the main tires, and a hole will be cut in the fuselage to accommodate raising and lowering the gear. The underside of the fuselage will be armor-plated to protect the aircraft from any possible damage.



Ames-Dryden project pilot for the landing gear tests is C. Gordon Fullerton, a veteran of two Space Shuttle flights.

Other organizations involved in these tests are the NASA Langley Research Center's Landing Impact Dynamics Facility, Hampton, Va.; Wright-Patterson Air Force Base's Landing Gear Development Facility, Dayton, Ohio; the B.F. Goodrich Facility, Troy, Ohio; and Rockwell International's Space Transportation Systems Division, Downey, Calif. ■

Truly Recipient of 1988 Collier Award

"For outstanding leadership in the direction of the recovery of the nation's manned space program."

So reads the Collier award citation recently presented to NASA's then Acting Administrator Richard H. Truly. The award, one of the most prestigious, is presented annually for the greatest achievement in aeronautics or astronautics in America.

The program is sponsored by the National Aeronautic Association and hosted by the National Aviation Club.

The nomination states, in part, "His three years as Associate Administrator for Space Flight have been both traumatic and triumphant. Following the Challenger tragedy Admiral Truly directed a comprehensive review of Shuttle systems, hardware, procedures and organizational structure. The result was the spectacularly successful return to flight with launch of Discovery, September 29, 1988, on STS-26. Admiral Truly's personal integrity and credibility were instrumental in restoring the agency's confidence, pride and stature.... This transformation is attributable both to the agency's uniquely talented government/contractor workforce, and to the leadership of Richard Truly." ■

The Collier Trophy

NASA NEWS CAPSULES

News Capsules are NASA news releases edited by the Internal Communications Branch, Office of Communications.

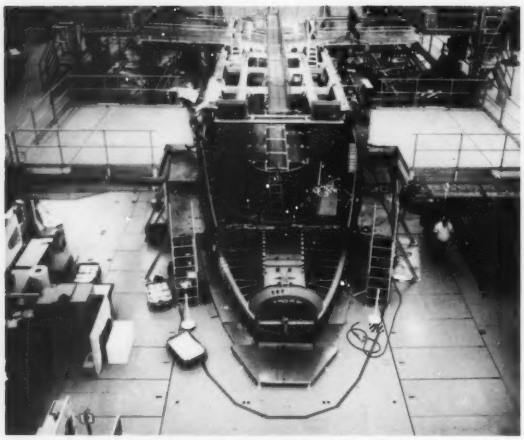
Second X-29 Research Aircraft Initiates New Flight Research Program at Ames-Dryden

Ames-Dryden Flight Research Facility, Edwards, Calif., has initiated a new flight research program with the second X-29 research aircraft. The first X-29 completed its flight program in December 1988.

The second X-29 is flying in a new, high angle-of-attack research program. The airplane is identical to the first X-29, except for some instrumentation changes and a spin parachute for emergency spin recovery.

The first flights, flown recently, were functional check flights to verify that all aircraft systems were working properly. The spin recovery parachute was deployed once during the check flights.

At the controls for the first flight of the second forward swept wing craft was NASA X-29 chief project pilot Stephen D. Ishmael. ■



OV-105, recently named "Endeavour" by President Bush, is shown under construction at the shuttle assembly facility in Palmdale, Calif. The name "Endeavour" stemmed from a nationwide competition involving 71,000 students and was won by Senatobia Middle School, Senatobia, Miss. and the Tallula Falls School, Ga. British Captain James Cook's 18th-century exploration ship "Endeavour" was the inspiration for the student submissions.

Upcoming Shuttle Flight Sequence

NASA has announced the order of planned Space Shuttle flights between the Galileo mission to Jupiter and the Astro Spacelab mission.

After the Galileo mission, currently manifested for Oct. 12, 1989, the sequence of flights will be: the DOD mission, previously delayed to "protect" the Galileo launch window; the Syncom IV deployment/LDEF retrieval mission; a DOD mission; the Hubble Space Telescope mission; and the Astro mission.

NASA management decided to fly only one mission between Magellan and Galileo to be as certain as possible that the Shuttle program would be ready to launch Galileo early in its planetary window. ■

CAPPS: NASA/DARPA Low-Cost Computer

Ames and the Defense Advanced Research Projects Agency (DARPA), have demonstrated a low-cost parallel-processing computer with the potential of producing capabilities equivalent to today's most advanced supercomputers.

NASA Program Manager Betty Berkstresser said, "(The) demonstration of the power of parallel-processing computers, configured for specific applications, opens new horizons for the scientific and engineering community."

Col. L. "Doc" Dougherty, DARPA program manager added, "It is a good solution for engineering teams that need a dedicated computer for structures, aerodynamics or electromagnetic design."

General Microelectronics, Inc. (GMIC), San Diego, Calif., under a subcontract to Northrop Corp., Hawthorne, Calif., which provided a significant financial contribution, developed the Configurable Architecture Parallel Processing System (CAPPS). ■

Astronauts Named to Two DOD Missions

Shuttle crew members have been named for two Department of Defense-dedicated Shuttle missions scheduled for mid-1990.

USAF Col. Richard O. Covey will command STS-38, a classified DOD mission aboard the Space Shuttle Atlantis scheduled for launch in May 1990. Covey's pilot will be USN Cmdr. Frank L. Culbertson. Assigned as mission specialists are USMC Col. Robert C. Springer, USAF Maj. Carl J. Meade and USA Capt. Charles D. "Sam" Gemar.

Named as mission specialists for Shuttle mission STS-39, an unclassified DOD mission aboard Space Shuttle Discovery scheduled for launch in July 1990, are USAF Col. Guion S. Bluford, Jr., Richard J. Hieb and Charles Lacy Veach. ■

HUMAN FACTORS

Lenoir, Kohrs Selected for Space Station

Lenoir

Kohrs

NASA Administrator Richard H. Truly has named Dr. William B. Lenoir as associate administrator for Space Station. In addition, Lenoir has been asked by Truly to develop a plan for the consolidation of the Offices of Space Flight and Space Station.

Truly also announced the appointment of Richard Kohrs as director, Space Station Freedom, located at NASA Headquarters, Washington, D.C. In this position, he will be responsible for design, development and future operations of the Space Station. Kohrs was deputy director (program), National Space Transportation System. Ray Tanner becomes the deputy director, Space Station Freedom Program and Operations, located at Reston, Va.

"Bill Lenoir is highly qualified and brings with him experience in NASA, space flight and private sector activity. I am extremely pleased that he is willing to return to the government," Truly said. "In addition, Dick Kohrs' experience in the Space Shuttle program makes him the best choice to lead Space Station Freedom through the challenges facing this program, which is the linchpin of this nation's future in space. I can't imagine a better team of managers to guide the development of America's space station."

Lenoir was vice president and a member of the board of directors of Booz-Allen & Hamilton, Inc., Bethesda, Md., and also managed the company's Space Systems Division. He directed the Booz-Allen role in the Grumman program support contract for Space Station, including responsibility for space operations integration, technical and management information systems support and systems engineering and integration for the Space Station assembly process. He also has managed several major Booz-Allen efforts in systems engineering, systems analysis, economic/cost analysis, system integration and program support.

Lenoir served as a NASA astronaut from August 1967 to September 1984. He flew in 1982 as a mission specialist on the STS-5 mission, the first operational flight of the Space Shuttle Columbia. After STS-5, Lenoir was responsible for the direction and management of mission development in the astronaut office at the Johnson Space Center, Houston.

Lenoir also supported the Space Shuttle program by providing operations and management consulting, including focused efforts for the Challenger accident recovery program. Prior to the STS-5 mission, he led the NASA Satellite Power Team and served as a backup science pilot for Skylab 3 and Skylab 4. ■

Keller Named Associate Deputy Administrator

NASA Administrator Richard H. Truly named Samuel W. Keller as associate deputy administrator, the third-ranking position at NASA. In doing so, Truly moved quickly to address what he called his "first and top priority," filling vacant leadership positions at NASA Headquarters and field centers.

Truly called Keller "one of NASA's best professionals. He has a depth of experience and is just the kind of leader and decision-maker that NASA needs."

Keller has served as deputy associate administrator for space science and applications since December 1977. He succeeds Dr. Noel W. Hinners, who recently resigned.

Before coming to NASA Headquarters in 1975, Keller served as director of administration and management at Goddard Space Flight Center, Greenbelt, Md. He also held other management positions at Goddard and previously worked at the Applied Physics Laboratory and the Naval Research Laboratory. ■

Smith Appointed Deputy, Stennis

The appointment of Gerald Smith as deputy director of NASA's John C. Stennis Space Center (SSC), Miss., has been announced by Center Director Roy Estess. Smith assumed his new duties June 17th.

Since 1986, Smith managed the solid rocket booster project in the Shuttle Projects Office at NASA's George C. Marshall Space Flight Center, Huntsville, Ala. In April 1985, he was detailed to NASA Headquarters, Washington, D.C., as acting chief, Engine Programs Branch, Shuttle Propulsion Division in the Office of Space Flight.

Smith joined MSFC in September 1961 as a member of the former Structures and Mechanics Division. ■

Green, Pulliam Receive Arthur S. Flemming Honors

Green

Pulliam

James L. Green of Goddard Space Flight Center and Thomas H. Pulliam of Ames Research Center have been honored with the Arthurs S. Flemming award in Washington.

The award honors outstanding individuals in the Federal Government who show extraordinary commitment to excellence in serving the people of the United States, who are dedicated to improving the day-to-day operations of the government and who contribute their talents to improving the conditions of the local community.

Green, head of the National Space Science Data Center and associate chief of the Space Data and Computing division of Goddard, was cited for his innovative technical and scientific leadership in the design, implementation and expansion of the Space Physics Analysis Network, SPAN. Green shares his knowledge, working with teachers and high school and university students.

Pulliam, head of Ames Research Center's Computational Physics Section, was recognized for his outstanding contributions to the field of computational fluid dynamics including the development of scientific computer research codes that have been requested by over 100 government and industry aerodynamics groups. He has been involved in a variety of youth programs in the Bay Area. ■

Lee Recipient of National Equal Opportunity Award

Robert B. Lee, senior research scientist in the Langley Radiation Sciences Branch, has been awarded the 1989 Research Achievement Award by the National Association for Equal Opportunity in Higher Education (NAFEO). The award is NAFEO's highest honor in research.

Lee accepted the award at the 14th National Conference of Blacks in Higher Education, held recently in Washington.

NAFEO, founded in 1969, consists of the 117 historically black colleges and universities. Lee was nominated by Norfolk State University.

Lee is a member of the Earth Radiation Budget Experiment (ERBE) science team. An international expert on the variability of the Sun's radiative energy, Lee is also a member of science teams for two Earth Observing System (Eos) climate experiments proposed for Space Station Freedom and polar spacecraft platform, scheduled for launches in the 1990's. He has served on the National Academy of Science Instrument Working Group on Solar Radiative Output Variability and on the National Oceanic and Atmospheric Administration's Eos Spacecraft Platform Instrument Working Group.

Lee began his NASA career at Langley as a cooperative training student from Norfolk State University. ■